

# DOE, Tampa Electric Sign Agreement to Add 'Intelligent' Computer System to Florida Power Plant

## Latest Effort to Apply 'Neural Networks' To Upgrade Power Plant Performance

*Tampa, Florida* - The U.S. Department of Energy has signed an agreement with Tampa Electric Power Company to demonstrate how advances in 21st century computer technology can make a vintage-1970s coal-fired power plant run cleaner and more efficiently.

The agreement calls for engineers to install a new "neural network-driven" computer system in one of the boiler units at the Big Bend Station near Apollo Beach, Florida. Designed to prevent soot from building up in coal plant boilers, the system will also enable the plant to reduce air emissions, such as nitrogen oxides.



Tampa Electric's Big Bend Power Plant in Florida will soon use artificial intelligence to keep its boilers clean and reduce air pollutants.

Photo: Tampa Electric Co.

The \$2.38 million project is the latest in the Energy Department's efforts to apply the remarkable capabilities of advanced computing to the operation of coal-fired power plants. Already, an artificial intelligence system pioneered in the department's Clean Coal Technology Program is being used commercially to fine-tune the performance of low-NOx burners.

[ [Read more about the Generic NOx Control Intelligent System.](#)]

Now the capability of new computer software to recognize patterns and make decisions accordingly – in other words, to "learn" in a way that mimics simple biological nervous systems – is being applied to other aspects of a power plant's operation.

In the Big Bend project, a computerized system will replace conventional, manually-operated "sootblowers." Sootblowers use high-velocity jets of steam or air to blow carbon residue off the inside surfaces of coal-fired boilers. A typical mid-size coal-fired power plant can have a hundred or more sootblowers. Most operate on an automated, time-based sequence and indiscriminately clean the boilers whether they are dirty or not.

In a 445-megawatt unit of the Big Bend plant, engineers will install a "Neural Network-Intelligent Sootblowing" process. The system is designed to recognize soot buildup and manage the sequence of cleaning based on the actual 'real time' need. Moreover, it can detect which specific sections of a boiler need cleaning and activate an individual blower or sets of blowers for just that area.

The result is optimal cleaning of the coal boiler's tubes and interior walls. But the benefits extend well beyond just a clean boiler.

Because heat is transferred more efficiently in a clean boiler, the plant's overall power efficiency is improved – and that means more power can be sent to the grid. In the Big Bend project, electricity output will be raised by two percent – seemingly a small amount, but in a large power plant that runs almost continuously, every added percentage point means significantly more power for consumers.

There are also environmental benefits. Although coal plants have devices to capture soot in the flue gases exiting boilers, the more soot that can be collected inside the boiler means that less finds its way up the smokestack and potentially escapes into the air.

The most significant air quality benefit will be a reduction in nitrogen oxides, or NOx. NOx can contribute to urban smog and acid rain and is one of the pollutants targeted for major reductions in President Bush's Clear Skies initiative.

In a boiler, some NOx comes from nitrogen in the coal, but a large amount can also be created when temperatures spike high enough to cause nitrogen in the combustion air to recombine into the pollutant. By keeping the inside surfaces of the boiler clean, heat from coal combustion can be distributed more evenly, preventing the sudden formation of hot spots that can produce NOx. At the Big Bend plant, the new sootblowing system is expected to reduce NOx by an additional 30 percent.

The new technology is also expected to extend the life of the power plant's equipment, saving the utility and ratepayers expensive maintenance and replacement costs.

The Energy Department selected the Big Bend project in a program called the "Power Plant Improvement Initiative." Carried out in 2001 after a series of brownouts and blackouts plagued major regions of the country, the initiative targeted new technologies that could help coal plants improve their environmental performance and boost their output. Coal plants are the current workhorses of the U.S. power industry, accounting for more than half of the nation's electricity.

Since the project was selected last October, officials of the Energy Department and Tampa Electric have been working to finalize details of the project. The department will finance just over \$900,000 or 38 percent of the cost, while Tampa Electric will contribute the remaining \$1.46 million or 62 percent. The Energy Department's National Energy Technology Laboratory will oversee the project and collect data on the operation of the new computer system for the next three years.

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**For more information, contact:**

David Anna, DOE National Energy Technology Laboratory, 412-386-4646,  
e-mail: [anna@netl.doe.gov](mailto:anna@netl.doe.gov)

**Program contact:**